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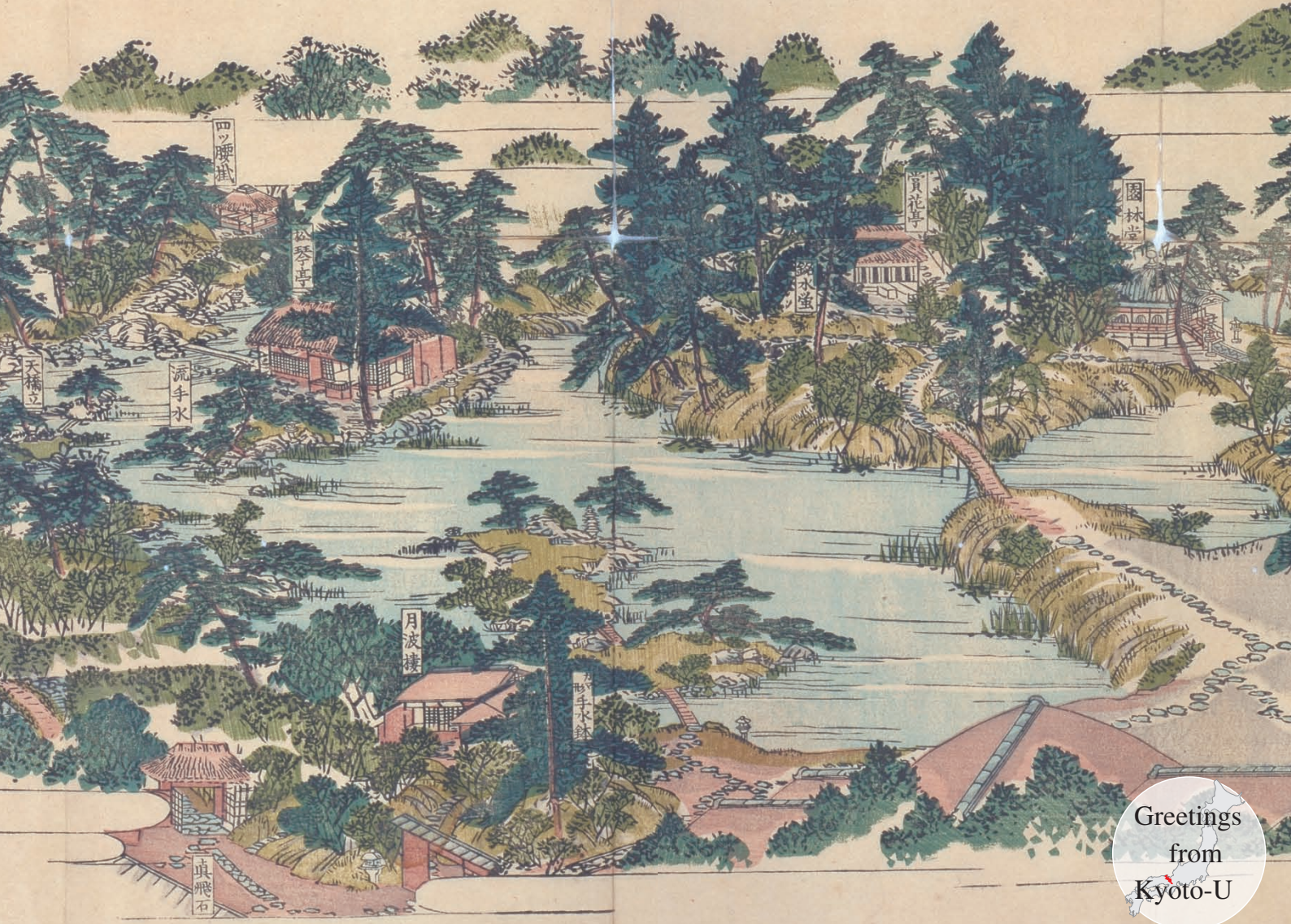
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楽

[Raku-Yu]

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香炉机一脚總テ御疊紺ノ布縁ナリ
○御庭向

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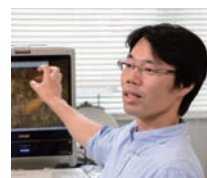
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A Note on Order of Names

As a general rule, names appearing in *Raku-Yu* are written in given name/family name order.



This name was taken from the assembly hall called “*Raku-Yu Kaikan*” that commemorated the 25th anniversary of the founding of Kyoto University.

Editor's Notes

As is discussed in the feature in this issue, Kyoto University dedicates itself to both basic and applied research. Since universities are expected to contribute to society more than ever before, the value of applied research is further heightened. However, we are convinced that basic research also indirectly contributes to society in the long run.

Kyoto University is devoted to gaining invisible long-term fruits as well as visible short-term results. This mission can be fulfilled, we believe, through the organic integration of research, education, and social contribution.

Cover: Birds-eye View of Katsura Imperial Villa—From the Old Map Collection of the Kyoto University Library

Katsura Imperial Villa was constructed during the seventeenth century as a detached palace for the Hachijo-no-Miya family, members of Japan's Imperial Family. Situated beside the Katsura River, which flows through the western part of Kyoto City, the villa covers an area of approximately 70,000 square meters, of which about 58,000 square meters comprises a garden with a large pond. This garden, featuring a walking path around the pond, is well known as a masterpiece among Japanese gardens. In addition to the garden, the villa is highlighted by a group of buildings including the Koshoin and Chushoin. Representing deep spirituality in a simple design, the villa has been praised by many celebrated architects and artists both within and outside Japan as the crystallization of Japanese aesthetic sense.

The cover of this issue displays part of a birds-eye-view illustration of Katsura Imperial Villa, to which a detailed description is attached regarding the history of the villa and the layout of its buildings and garden. It is assumed that the illustrated work was created in 1879 by an individual who was permitted to enter the villa. Since admission used to be strictly controlled, probably this visitor was deeply impressed to see the garden, and created the illustration to share with his friends.

The Role of Public Relations as a “Window” of Kyoto University

In October of 2014, I assumed the office of Executive Vice-President for Gender Equality, International Affairs, and Public Relations. Prior to assuming this post, I was the Vice-President for Gender Equality, so international affairs and public relations are new challenges for me.

I believe one of the major characteristics of Kyoto University is its relationship with the city, an ancient capital with a history of more than 1,000 years. Kyoto passes on its long history to people today by disseminating its original arts and culture to the world. As a university rooted in this ancient capital, Kyoto University must continue to provide global society with the latest, in-depth information, based on both extensive and intensive research activities.

From a public relations standpoint, it is essential to communicate the activity of the university in a clear, accessible fashion. By doing so, I believe that the university can also fulfill its accountability.

We have a long history of open communication through various media outlets. I would like to thank our past and present staff for their ongoing and continuous efforts to this end. In addition to the semiannual English newsletter *Raku-Yu*, we issue a quarterly *Research Activities* journal to disseminate research results. Kyoto University's e-mail newsletter and Facebook page are also accessible online. Last year we radically revised the university's website.

However, our English web pages still need substantial improvement to allow our university to reach a more global audience. I will prioritize this task this year.

At his inauguration, President Juichi Yamagiwa announced his “Window Concept” as a backbone of the university's reforms to be implemented over the next 10 years. By this, the President means that Kyoto University must function as a “window” open to society and the wider world. The role of public relations is to function as a window to the university. With the assistance of our PR team, I will work to open this “window” even wider.



Kayo INABA
Executive Vice-President of Kyoto University



Kayo INABA Professor Kayo Inaba, Executive Vice-President for Gender Equality, International Affairs, and Public Relations, grew up in a small town in Gifu Prefecture. During her childhood, she often collected tadpoles from nearby rice paddies and observed their growth. Since then, she retained her consistently keen interest in living things.

“Look at this photo of a lizard that I found near the campus,” she said, beaming a smile that has undoubtedly not changed since childhood. After majoring in botany at Nara Women's University, she entered the master's program at Kyoto University. Changing her research focus from plants to animals, she began studying immune cells. When her research on dendritic cells attracted attention from other researchers at academic meetings, she went to the United States in 1982 to work with Dr. Ralph M. Steinman, with whom she collaborated for nearly 30 years. At Rockefeller University, she was absorbed in research activities. “I studied from early morning to late at night, even on weekends. But it was truly fun to find something new.” She looked truly happy when she recalled her days at Rockefeller University.

As a pioneer among women researchers, she became the “first woman” to assume various positions at Kyoto University. In 2007, she became the Director of the Center for Women Researchers, and in October of 2014, she assumed her present post. While dedicating herself to assisting women researchers and to increasing their numbers, she also reminds women researchers that instead of relying on assistance, they should be determined to develop their own careers. Her gentle smile is grounded in her strong resolution and deep dedication to research, and her pride in adhering to her chosen path.

Aiming for the Best in Basic Research

Leading Researchers Discuss the Future of Basic Research at Kyoto University

Last year, Honorary Doctor Isamu Akasaki received the Nobel Prize in Physics. As he is a graduate of Kyoto University, his achievement once again demonstrated Kyoto University's substantial contributions to the world in basic research. Currently, however, there is a trend towards valuing practical research yielding measurable short term results over basic research which can take a long time before bearing fruit. For this issue of *Raku-Yu*, your correspondent hosted discussions by three exceptional researchers leading their respective academic disciplines for many years. Reminiscing on their own research careers, the three emphasized the vital importance of basic research, pointing out Kyoto University's strengths in basic research programs.

Selection of Research Themes

Moderator: To begin with, would you please describe how you selected your research themes and when you became interested in those particular themes?

Inami: During the summer holidays of my second year of senior high school, I began reading a digest of *The Dream of the Red Chamber* (the *Hong Lou Meng*), which was on a bookshelf in my house. The book was so interesting that I bought a full translation that autumn and spent most of my time reading it. The story revolves around 500 characters, each presented in such an extremely exciting manner that I read the book repeatedly. Although the main plot consists of a romance between a boy and two girls, the daily life of a large family is detailed as a backdrop. The author vividly depicts how each person lives in the large family.

Moderator: What made you decide to translate the novel?

Inami: From the moment I read the Japanese translation, I wanted to read the original. Having heard that Kyoto University was the best place to study classical Chinese literature, I entered the university and continued

studying the *Hong Lou Meng*. Gradually, I began to aspire to translate it myself. Since it was such a long novel, it took me about 25 years before I decided to undertake a full translation. After making up my mind, it took 15 years to complete the translation. It may sound an exaggeration, but I thought that the translation would be my lifework.

Mori: During my childhood, I embraced an aspiration to become a scientist. During my elementary and junior high school days, elementary particle physics boomed, driven by the discoveries of quarks such as “up” and “charm.” The discoveries stimulated my curiosity: I wanted to know to what level matter could be deconstructed. In my third year of junior high school, Dr. Makoto Kobayashi and Dr. Toshihide Maskawa theorized that there had to be at least six “generations” of quarks, not just the three that were known at the time. Since both scientists were related to Kyoto University, I became even more eager to enter Kyoto University to study physics. My aspiration was also driven by the fact that Dr. Hideki Yukawa and Dr. Shinichiro Tomonaga had graduated from the university.

At the time of my enrollment, the term “gene” started to appear frequently in newspapers. At first I was surprised to learn that all creatures, ranging from bacteria to humans, use the same genetic code. When I learned of this basic and simple rule, I aspired to study molecular biology. Before completing my doctoral program, I obtained a post as a research assistant at Gifu Pharmaceutical University. However, I resigned that post shortly thereafter and went to the University of Texas to research

molecular biology. In Texas, I encountered Unfolded Protein Response (UPR), and for the 26 years since then, I have engaged in research on this theme.



Moderator: Professor Yamagiwa, will you tell us what made you pick gorillas as your research theme?

Yamagiwa: During my high school days, I wanted to become an astronaut. My interest in astrophysics led me to study physics and mathematics, which I found very stimulating. Since I greatly admired Dr. Hideki Yukawa, I enrolled in the Faculty of Science at Kyoto University. I joined the skiing club at the university, and at a training camp held at Shiga Heights, I met a student observing monkeys in the snow. After this first encounter with the academic field known as primatology, I began attending lectures and seminars on the subject, offered by the Faculty of Science. At that time, the Faculty of Liberal Arts held lectures on anthropology, and there was an interdisciplinary research group on anthropology. It was great fun to see many students majoring in diverse disciplines in that group. After enrolling in graduate school, I traveled across the Japanese archipelago to observe Japanese macaques in the wild.

Primatology is designed to explore human evolution through the study of primates. At least in Japan, primatologists seek to study humans through the eyes of non-human primates. In this context, I found that Japanese macaques are more distant from humans than chimpanzees and other apes. Since there are no wild habitats for apes in Japan, I contemplated Africa. Back in 1958, Dr. Kinji Imanishi was studying



gorilla family systems in Africa, but gorilla research had been discontinued in Japan. My mentor suggested, “You have a big body, so you might be good at studying gorillas.” His suggestion prompted my study gorillas. I selected gorilla family systems as my research theme, and observed them in the field. This attempt did not go well, probably because the gorillas I observed were not accustomed to human beings. So I joined a team observing gorillas under American primatologist Dian Fossey in Virunga, in the Democratic Republic of the Congo. However, my research activities were repeatedly interrupted by armed conflict. Like a refugee, I had to move from one country to another to avoid conflict, from the Democratic Republic of the Congo to the Republic of the Congo, and then to Gabon. About 15 years have passed since I settled in Gabon.



Moderator: You said that you studied anthropology from the viewpoint of cultural sciences. Is that related to your studies of gorilla family systems?

Yamagiwa: Yes, there is a strong relationship. During the early days of my research, anthropologists had argued that incest taboos were the first human norm, and that human family systems would not have developed without this taboo. They believed that humans became humans with the establishment of incest taboos. Meanwhile, my mentor, Professor Junichiro Itani, suggested that primates tend to avoid incest, and that this incest avoidance was the key to

building social systems among primates. It is noteworthy that both the anthropologists and Professor Itani shed light on incest; the remaining question resides in the evolution from incest avoidance to incest taboo.

Common Research Interests

Inami: Professor Yamagiwa just mentioned gorilla family systems. The main theme of the *Hong Lou Meng* is also an extended family. Although my initial interest in the novel was its plot, I gradually began to pay greater attention to human relations in large families, or in other words, how people understand their positions within the family. While contemplating this matter, I got an inspiration from the positioning of soccer players. Around 1970, when the ninth FIFA World Cup was held in Mexico, the Brazilian national team was the strongest in the world. Watching the players’ smooth interactions, I thought that the characters of the *Hong Lou Meng*, including not only family members but also servants, behaved according to their positions, just like Brazilian soccer players move to the best positions at each moment. I found it very interesting to see how characters changed their positions in the large family in response to the changing environment. In translating the novel, I added many notes concerning this point.

Moderator: Are the intra-family relations you have just mentioned unique to China?

Inami: Intra-family relations are certainly an essential point in understanding large Chinese families. I heard from some Chinese people that you could better understand China’s political affairs if you read the *Hong Lou Meng*. The essence of political affairs resides in human relationships, which are constantly changing depending on the situation. I have an impression that Chinese people are constantly aware of the variability of human relationships, and behave according to their present positions, probably subconsciously.

Yamagiwa: In a society of non-human primates, if one leaves its group, it loses all the relationships it has formed in that group, so it must build totally new relationships in a new group. In the case of human beings, on the other hand, we can maintain human relationships even after leaving a group. This is very interesting, but we still do not know why humans have achieved this ability. While humans can belong to multiple groups, it is absolutely impermissible from an animal viewpoint. I hope to clarify why humans have become able to join multiple groups and maintain relationships in them. Probably the *Hong Lou Meng* would provide good research material for my study, too.



Challenges in Research

Moderator: Next, would you please tell us about some challenges you have encountered in your research activities?

Inami: I found it challenging to select appropriate Japanese terms to replace some Chinese words in the source text. Even though dictionaries help me, I cannot simply pick words from dictionaries; before selecting the right term, I have to consider the meaning of each episode in the entire story, and how each character recognizes his or her position in the family. I have to choose Japanese terms depending on how Character A recognizes his or her relationship with Character B. It was most challenging for me to select the most suitable term that does not mislead readers.

Moderator: I got the impression that you translated the novel for contemporary readers. If so, don't you think that your translation will go out of date in the future?

Inami: That's perfectly all right with me. I believe all translation is something like that, that it goes out of date someday. If it becomes obsolete, someone else can translate it again. My belief that no translation can perfectly correspond to its source text

reassures me and allows me to take some liberties in my translation work.

Moderator: What do you mean by "take some liberties"?

Inami: For instance, I used buzzwords from the 70s. Instead of writing "What relationship do you have with that girl," I use the phrase: *anta, anokono nannanosa** (Hey, what are you for her?) In my student days, a professor of Chinese language told us that even sentences written by stern and serious scholars might contain buzzwords and slang of their time. While describing a sentence written by a great Chinese scholar of the 18th century, the professor said, "Don't you think it possible that he used popular expressions,



such as 'Wait three minutes'?'***

Remembering the professor's words, I used some buzzwords and slang.

Moderator: Professor Mori, would you tell us about challenges you faced?

Mori: After discovering a molecule that would provide us with information essential to elucidate UPR, I continued experiments to reveal the function of that molecule. In the final stage of the experiment, when I was sure that we would soon find all the evidence we needed, I heard the news that another big name researcher was doing exactly the same research, had found the same molecule as we, and had already written a paper. I was truly disappointed. However, since we were in the final stage of our research project, I pursued experiments to their completion. Later I found out that although he described the discovery of the molecule in that paper, he did not characterize it thoroughly. Since our paper contained a complete description of its mechanism, in an unusual move, the journal "Cell" published ours even though it postdated his. I am gratified that I did not give up.

The Thrill of Basic Research

Moderator: Currently, social attention is focused on practical research programs, which bring about measurable results in the short term. Would you give us your views about this trend, or about the importance of basic research?

Inami: I believe it very important to recognize the boundless scope of learning. My graduate classes concern the fundamentals for researchers of Chinese classics, since I teach how to deal with and classify classical works of Chinese literature. Among my students there was a very serious woman who was enrolled in the doctoral program at the Graduate School of Education. One day, she told me that my class on the classification of Chinese classics was very stimulating and useful for her clinical psychological studies, since she had to classify various clinical cases. Her words made me realize that despite the

Participants:



Juichi YAMAGIWA
(President of Kyoto University)

Born in 1952. As one of the leading primatologists in the world, he has undertaken studies of gorillas in Africa for the past 40 years. He was president of the International Primatological Society.



Ryoichi INAMI
(Director, Institute for Research in Humanities, Kyoto University)

Born in 1953. In 2014 he completed a translation of the *Hong Lou Meng* (in seven volumes), a masterpiece of classical Chinese literature, for which he won the 66th Yomiuri Prize for Literature in Scholarship and Translation.



Kazutoshi MORI
(Professor, Graduate School of Science, Kyoto University)

Born in 1958. For more than 25 years, he has been engaged in research on UPR. He received the Canada Gairdner International Award, the Lasker Award, and many other awards in recognition of his achievements in clarifying UPR mechanisms.

difference in disciplines, Chinese literature and psychology both require classification techniques. I believe that barriers between disciplines are much easier to overcome than commonly believed. We should probably consider the importance of basic research in this context. In this sense, the Institute for Research in Humanities is an outstanding organization. To review the importance of basic research from diverse viewpoints, we should invigorate organizations that involve researchers both from natural sciences and from the humanities.

Mori: The discoveries of basic research open new perspectives for other research. This as thrilling as it is important. Researchers engaged in basic research must present views that offer useful information to research in other academic fields. In our case, we clarified the mechanism of UPR in mammals, and presented markers that indicate abnormalities in endoplasmic reticula. Now physicians can analyze whether the symptoms they observe are related to abnormalities in patients' endoplasmic reticula. Although we already clarified the mechanism of UPR and presented a new perspective, this should not be the end of our program. Delving deeper into the issue will lead us to yet newer perspectives.

Kyoto University's Pride in Basic Research

Moderator: Is Kyoto University unique among Japanese universities in its approach to basic research?

Yamagiwa: One strong point of Kyoto University is that despite our limited budget, we allow researchers to freely conduct research on themes they have selected. Kyoto University has produced many Nobel Prize laureates, particularly in Physiology or Medicine, and Physics. This is because Kyoto University encourages researchers to engage in original programs by fully pursuing their respective inspirations and ideas. I believe that Kyoto University should maintain and develop this tradition even further.

Mori: The university's location in Kyoto

probably helps us to maintain our originality. If the university were located close to the seat of government, we could obtain more information, but maintaining our independence would be more difficult. It is good to be located a little distant from the capital city, since we can maintain our own stance. We don't interfere in others' affairs, and if we research well, no one will object. In Kyoto, we can keep going our own way, as long as we cause no problems.

Yamagiwa: We value the traditional spirit of "*Hona yatte minahare*" ("Well then, go for it/check it out! and we'll support you when necessary" in Kansai dialect).

Moderator: Isn't it important to instill that traditional spirit into front-line researchers and students lest the tradition will decay?

Yamagiwa: In primatology, it is essential to observe animals in the field, in their natural habitats. We must similarly observe plants and insects. To understand why they follow certain behaviors, and what is happening to them, it is important to observe animals and their ways of life in their natural environments. To have diverse viewpoints, it is necessary to transcend interdisciplinary barriers and obtain inspiration from researchers in other disciplines. During my student days, there was a research group titled *Konoe Rondo de Antropologio*. At its regular meetings held in Raku-Yu Kaikan Hall, professors from both the humanities and the natural sciences held lively discussions. Sometimes their arguments became so heated that they quarreled with one another like freshmen. I joined the meetings and found them extremely stimulating and inspiring. The participants gathered there simply to enjoy discussions and to hear the views of researchers in other academic fields. Kyoto University can still provide a platform for such stimulating discussions.

Mori: On the evening before the award ceremony of the Lasker Awards, I was invited to a dinner where I sat next to the President of the Howard Hughes Foundation, a basic research scientist whose paper I had cited in my first paper at the University of Texas. When I met him, he had been serving as the



President of the Foundation for six years, but he continued to preside over his own laboratory and to write papers in order to remember the challenges and importance of basic research.

I had heard that the Howard Hughes Foundation invested not in projects but in individuals. The foundation supports young talented individuals, letting them investigate freely, in the hope that they will achieve outstanding results. I believe this is one of the strong points of the United States.

Moderator: Kyoto University, with its traditional spirit of "Go for it/check it out!" has a cultural climate similar to that of the Howard Hughes Foundation.

Yamagiwa: Kyoto University takes pride in its basic research in both humanities and natural science. To conduct basic research, however, we need a strong backbone. That is, we must distance ourselves from social trends, and persist in our own way without being influenced by popular values. Kyoto University must maintain an environment that allows researchers to pursue themes of their own interests. The academic field that you are specializing in might disappear 10 years or 20 years from now, but a new academic field might spin off from that field. We have seen the emergence of a new field of iPS cell research. Although it was originally a part of regenerative medicine, it has become an independent discipline. The basic research conducted by Kyoto University can facilitate this expansion of knowledge in other fields as well.

* "*anta, anokono nannanosa*": a phrase from a hit song popular during the 70s

** "Wait three minutes": a phrase from a TV commercial for a vacuum-packed curry sauce popular during the 70s

KU Alumnus and Nobel Laureate Isamu Akasaki Receives Honorary Doctorate, Delivers Commemorative Lecture

May 15, 2015

Dr. Isamu Akasaki, 1952 Kyoto University graduate, Distinguished Professor and Professor Emeritus of Nagoya University, and currently Professor at Meijo University, visited his alma mater on May 15 to receive an honorary doctorate and give a commemorative lecture.

Kyoto University's honorary doctorate is conferred upon individuals who either (1) have made outstanding contributions to the University's education or research, or (2) have made exceptional achievements in science or culture that are deemed worthy of recognition by the institution.

Dr. Akasaki was awarded this distinction for the latter reason: his work leading to the "invention of efficient blue light-emitting diodes, which has enabled bright and energy-saving white light sources," an achievement for which he and two other researchers were awarded the

2014 Nobel Prize in Physics.

As the conferment ceremony began, President Juichi Yamagiwa congratulated the 86-year-old KU alumnus, saying, "You followed your insatiable curiosity and passion to open a new frontier in science, and in so doing, have become an inspiration to all our students."

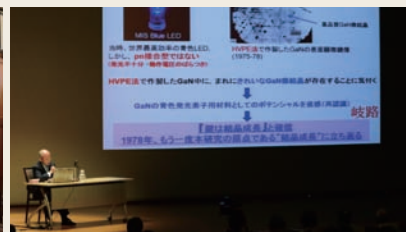
Dr. Akasaki responded: "I am extremely honored to be recognized in this manner by my beloved alma mater. I remember the time when, as a new KU student, I heard the news of Dr. Hideki Yukawa receiving the

1949 Nobel Prize in Physics. It all felt like something happening in another world. At the same time, however, I vowed that I too would accomplish something unprecedented – whether that would earn me a Nobel Prize or not. I would say that what I did with blue light-emitting diodes was without precedence. Honestly, I cannot help but be moved by this thought."

Following the ceremony, Dr. Akasaki delivered a commemorative lecture to the capacity crowd, bringing the day to a memorable conclusion.



President Yamagiwa (left) and Dr. Akasaki at the conferment ceremony



During the lecture

President Hosts Welcome Party for International Students

June 17, 2015

This year's Welcome Party for International Students, hosted by President Juichi Yamagiwa, took place on June 17 in the Clock Tower Centennial Hall.

Held annually since 1961, the party was attended this year by 364 newly enrolled international students and 85 representatives of Kyoto University and related organizations – including the University's President, Executive Vice-Presidents, Deans, and teaching staff – all of whom enjoyed this valuable opportunity to get to know one another in a friendly setting.

Following the welcome address by President Yamagiwa, who had many questions to ask the students, Mr. Martin Bacherneegg, a Japanese Studies student from Austria, thanked the University in fluent Japanese

and English on behalf of his fellow international students. Executive Vice-President Masao Kitano then opened the party with a toast to all present.

The welcoming entertainment, a staple of these events, featured dance and juggling acts, as in the previous year. First, Saikyozensen, Japanese and international students dressed in kimono style costumes, delivered a powerful performance of an act

entitled "Kyoen: Sodefure" to warm up the crowd. Next, the Juggling Doughnuts took the stage with a masterful and dynamic performance that mesmerized the whole audience.

Afterwards, some of the attendees came on stage to present their own songs and dances, further enlivening the party, which came to a close amid great merriment as everyone enjoyed the conviviality.



Dance performance by student dance team Saikyozensen



International students enjoying the party

Opening Ceremony for International Science Innovation Building

May 25, 2015

An opening ceremony to mark the completion of Kyoto University's International Science Innovation Building on the Yoshida Campus was attended by more than 150 guests from within and outside of the University on May 25, 2015. Construction of the Building was funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) as part of its academia-business collaboration program for establishing international science innovation facilities utilizing

local resources.

Following commemorative addresses by President Juichi Yamagiwa and MEXT Deputy Minister Sadayuki Tsuchiya, they conducted the ribbon-cutting ceremony, supported by Kyoto Prefecture Vice-Governor Akimasa Yamashita, Kyoto City Mayor Daisaku Kadokawa, and others.

Participants then toured the new facility and conversed amicably.

The International Science Innovation Building is expected to be

a center for creating new industries through collaborative activities between Kyoto-based businesses and universities.



Ribbon-cutting ceremony

KIM Hway-Suh

Cherry Blossoms

World-renowned
KU Alumni

Prof. Dr. Kim Hway-Suh
• Dean, College of Architecture,
Dankook University
• Honoray President, IBS
Korea
• Vice-President, Architectural
Institute of Korea



The time that I remember now as years of youth filled with unforgettable excitement and hope began when I entered the school grounds of Kyoto University's Department of Architecture for the first time, after viewing the cherry blossoms along the Kamo River along the way from Sanjo Keihan Station.

Having subsequently completed my Master's and Doctorate of Engineering at Kyoto University, I feel pride and self-esteem today for being a graduate of Kyoto University. I believe that I have contributed significantly to the industrial development in the fields of architecture and construction, and to education in Korea. Not only academic exchange but also personal exchange between Korea and Japan has rapidly brought our two countries closer to each other than ever before. Especially in the case of Building Science, my major interest, its technical status and effect is

seen very clearly not only in architectural studies but also in actual construction sites in Korean society.

My detailed activities in Korea have been as follows:

First, I have promoted intensified cooperation between the Architectural Institutes of Korea and Japan and the Architectural Society of China, while serving as vice-president of the Architectural Institute of Korea. I am also a founding member of the International Council for Asia Pacific Intelligent Green Building Alliance including Southeast Asia. In the context, I served as president of the Intelligent Building Society of Korea and president of the Facility Management Association of Korea, contributing greatly to the policy field of building energy assessment, operation and management, in affiliation with Korea's Ministry of Land, Infrastructure and Transport. In addition,

I played a vital role in development of the Light Pollution Prevention Law promoted by Korea's Ministry of Environment, so I was awarded with a presidential citation for Contribution to National Science Promotion & Development on Science Day in April 2011.

Furthermore, I continuously made efforts for international exchange with international sister universities while serving as Dean of External Cooperation at Dankook University. Currently, I actively coordinate external activities between Korea and African countries as Director of the Nelson Mandela Pacifist Institute affiliated with Dankook University.

I will never forget to express my continuing gratitude to my professors in Kyoto University, and to those seniors and juniors who gave me so much that has helped me in my professional activities.

World-renowned KU Alumni

The Kyoto University Amgen Scholars Program 2015

The Kyoto University Amgen Scholars Program aims to provide international undergraduate students, embarking on careers in biology or related sciences, with opportunities to work alongside experienced faculty members, including some of the world's top scientists. The 2015 program began on July 1, with an enrollment of twenty students selected from over five-hundred applicants based on their excellent academic records.

The students began work on an eight-week course of research, the results of which they will present at the end of the program. During the program

the students will also attend regular seminars that enable them to broaden their horizons by experiencing lectures by instructors from outside of their own faculty of affiliation. The program also includes many excursions and events to allow the students to experience

Japanese traditions firsthand. The first such excursion, held on July 10, was to a pottery making class. The students were able to make their own traditional pottery items, such as teacups, confectionary plates, and *matcha* tea bowls.



Faculty seminar



Pottery class

The SAKURA Science High School Program Comes to Kyoto University

Two sessions of the SAKURA Science High School Program, operated by the Japan Science and Technology Agency (JST), were held at Kyoto University on May 18 and July 6.

The program brings high school students from Asian countries to Japan to engage in exchange activities with Japanese students, familiarize them with Japan's advanced science and technology, and motivate them to study at universities in Japan in the future.

For the May session, thirty-six students from India and twenty from Malaysia participated in the program, and in July, the participants comprised thirty students from China and ten from Singapore. The program for both dates included a

morning session of science-related lectures. Then during their lunch breaks, the participants met with Kyoto University international students from their own countries for discussion sessions. The young students had many questions for their seniors, and took advantage of the chance to share their

thoughts and opinions.

After lunch, the senior students took the young participants to visit laboratories at three of Kyoto University's graduate schools, giving them insights into the university's research and education activities in science fields.



Welcome remarks from Prof. Toshio Sugiman, executive vice-president for student affairs and library services



A morning lecture session

Ms. Irene Nabanoba lost her father to HIV/AIDS in 2001, when she was 13 years old and living in Uganda. After his death, the bereaved family, consisting of Irene, her mother, her younger sister and two younger brothers, had to overcome various challenges. In 2005, Irene began to visit Uganda Rainbow House, established by Ashinaga, a Japanese NGO that provides psychological support to children who have lost their parent(s) to HIV/AIDS. The counseling and other care programs she received there inspired her to study hard, and as a result, she received a scholarship from Ashinaga to travel to Japan in 2010 and study at Kwansei Gakuin University. After graduating in 2014, she enrolled at the Graduate School of Medicine at Kyoto University, where she is currently studying public health with the aim of helping prevent further HIV/AIDS epidemics.

What was Uganda Rainbow House like?

At Rainbow House we were provided with books, pencils and other school supplies. We also went on a three-day camping trip. Most of all, Rainbow House was a place where I could meet many other children who had also lost their parent(s) to HIV/AIDS. Their presence convinced me that I was not alone. I also learned that there were people who could help and support me, and that losing your parent(s) should not mean that you have lost everything. Even if you have no parent(s), you can still become happy.

What made you decide to study at Kwansei Gakuin University, beginning in 2006?

In 2005, Ashinaga introduced a scholarship program, and I decided to apply to it. To make the most of that great opportunity, I studied hard in high school. Then, I enrolled at the School of International Studies at Kwansei Gakuin University, where I studied politics, economics, cultural affairs, business management and various other subjects.

After graduating from the university, you decided to enroll at the Graduate School of Medicine at Kyoto University. Why did you select such a totally different course from your undergraduate major?

In my graduation thesis I wrote about an organization that supports programs to prevent HIV/AIDS in Uganda. While conducting research on this theme, I found myself becoming increasingly interested in public health issues. I learned that Kyoto University has a graduate school where you can study public health in English. In addition, Professor Kihara has a

wealth of experience in HIV preventive measures. I found that his approach to the problem was just what I had been seeking. This made me decide to apply to the graduate school at Kyoto University.

Do you think that the programs of Uganda Rainbow House influenced your decision-making?

Certainly. The psychological support I gained from Uganda Rainbow House was very important for me. At Rainbow House we also received counseling concerning HIV and held many helpful discussions about preventive measures. I want to share the information I have learned with more young people. Since many young people lack knowledge about HIV/AIDS, I want to share my experience and knowledge with them.

What is your current research theme?

I am now surveying the behaviors of HIV/AIDS patients, particularly their approaches to disclosing their infection to people around them (especially their sex partners). I ask patients whether or not they have already revealed their illness to their sex partners. If they have, I ask them how long it took before disclosing and how they went about it. I ask those who have not to specify their reasons for not disclosing. I also tell them about the approaches that were taken by people who have already disclosed to others that they have HIV/AIDS.

Are many people still prejudiced against HIV/AIDS patients?

Yes, HIV/AIDS creates a deep stigma for patients. They are often regarded as having committed socially unacceptable acts. This harmful stigma is common around the world. In Uganda, where many people have witnessed the deaths of family or friends due to HIV/AIDS, this prejudice may not be as deep as it is in Japan, HIV infection is still stigmatized.

Finally, will you please tell us about your future plans to make use of the knowledge you have gained at Kyoto University?

I hope to join an organization such as UNICEF or the AIDS Support Organisation (TASO) promoting preventive measures in Uganda. I want to promote public awareness about this issue and inspire young people to change their behavior. In the long term, I hope to start workshops or projects to reduce the number of patients with HIV/AIDS. I also want to encourage patients with HIV/AIDS to maintain hope in their lives.

INTERVIEW

“I want to encourage patients with HIV/AIDS to maintain hope in their lives.”

Irene NABANOBA

Second-year graduate student, Graduate School of Medicine



Journey to the Insect Society

Uncovering the Secrets of Termite Queens

FOREFRONTS OF RESEARCH AT KYOTO UNIVERSITY

Termites in the black box

The word “termite” is generally associated with horrible house pests and major wood decomposers in forest ecosystems. The total number of termites on the planet is estimated to be roughly 240,000,000,000,000,000. This abundance of termites can be attributed to their overwhelming reproductive capacity, which is based on their sophisticated social life. Isoptera (termites) belong to the group of highly eusocial insects which also includes Hymenoptera (ants, bees, and wasps). Termites have often been compared to ants. However, the origins of these two social insect groups are quite distinct; termites are basically social cockroaches, whereas ants evolved from wasps. Compared to the rapid progress in ant studies since Hamilton first proposed kin selection theory in 1964, many aspects of termite biology still remain unexplored. Even the reproductive system of the termite *Reticulitermes speratus*, the most common species in Japan, was misunderstood until only recently.

Opening the black box

In most termite species, colonies are typically founded by a monogamous pair of primary reproductives (one king and one queen). It was long believed that the inbreeding cycles of generations of neotenic reproductives (colony offspring) propagated the colony after the death of the primary king and queen, and evidence for inbreeding depression in termites is mounting. Like most subterranean termites, *Reticulitermes* species have cryptic nesting habits with transient, hidden royal chambers found underground or deep inside wood, making it difficult to reliably collect reproductives (kings and queens). Therefore, the breeding system of subterranean termites has been estimated primarily by genotyping workers or culturing laboratory colonies rather than from census data from field colonies. This is one reason why the reproductive systems of some termites have been completely misunderstood in the past.

To obtain reproductives from a sufficient number of natural colonies, we collected more than 1,000 nests in the field, successfully identifying reproductives from 55 of them. In nearly all cases, the primary kings were present, whereas the primary queens had been replaced by a number of secondary queens (neotenic queens differentiated within the colonies). These results indicate that primary kings live much longer than primary queens and that replacement of primary kings is rare, whereas replacement of primary queens is the rule in the colony’s development.

Asexual queen succession

Our genetic analysis of the reproductives and other colony members has uncovered an extraordinary mode of reproduction. Whereas workers and alates are produced by means of sexual reproduction, secondary queens are exclusively produced parthenogenetically by founding primary queens.

The production of secondary queens through conditional parthenogenesis effectively extends the reproductive life of the primary queen, greatly expanding her reproductive capacity. This process of queen succession allows the colony to boost its size and growth rate without suffering any loss in genetic diversity or diminishing the transmission rate of the queen’s genes to her grand offspring. In actuality, termites are not produced by inbreeding. On the contrary, they avoid inbreeding completely by using parthenogenesis.

King-queen conflict over parthenogenesis

In the evolution of parthenogenesis, males and females are usually considered to be in conflict over genetic transmission because this reproduction method enhances female reproductive output but prevents any genetic contribution from the males. For males, any trait that coerces females into sexual reproduction should increase their fitness. In haplo-diploid social Hymenoptera (ants, bees, and wasps), unfertilized eggs become males while fertilized eggs produce females, giving queens a potentially powerful mechanism for controlling fertilization. However, in diploid insects, including termites, sperm release is generally activated through a neural loop whenever an egg passes the genital chamber, with no control over fertilization occurring. This raises an important question: how do termite queens produce parthenogenetic offspring even in the presence of kings?

Kenji MATSUURA

- Born in 1974
- Ph.D., Kyoto University
- Professor, Graduate School of Agriculture
- URL <http://www.insecteco.kais.kyoto-u.ac.jp/matsuura.html>

Research on termites could offer clues to research that benefits the future of humans.

In his childhood, Professor Kenji Matsuura loved to play outdoors in the fields. One autumn day, when he was in the third year of elementary school, he overturned a plywood board left in a field and found countless termites wiggling in the nest they had made in the board. He discovered that there were many types of termites that looked different and had different roles to play. Despite his young age, he was deeply impressed by the presence of natural laws that guided the termites’ lives. When he was in the sixth year of elementary school, he read the book *Hachi no Seikatsu (Bees’ Daily Life)* by Kunio Iwata, and this convinced him to become an entomologist. His intention was to join the Laboratory of Entomology (now the Laboratory of Insect Ecology) in the Faculty of Agriculture at Kyoto University, where the book’s author had studied. “It was Japan’s first laboratory of insect ecology, established 90 years ago. Everyone wishing to study entomology was eager to enroll in the laboratory,” Professor Matsuura explained.

He began full-fledged studies of termites when he was a junior at Kyoto University. Since few researchers were studying termites then, he had to develop everything from scratch – including appropriate methods of keeping termites and the best procedures for analyzing their behavior. This meant that he spent a great many hours on his new-found passion. “Since students were not allowed to use incubators, during winter I kept termites underneath the *kotatsu* (small quilt-covered table with a heater underneath) at my lodging. Of course I didn’t mention this to my landlord,” he said with a smile. While most other researchers took biological approaches to the study of termites, Professor Matsuura took an ecological approach. He was the first to clarify the mechanism by which termite queens switch between sexual and asexual reproduction. His findings are expected to provide clues to resolving one of the most enduring puzzles in evolutionary biology: why sexual reproduction is virtually ubiquitous.

Closing the sperm gates of eggs

To identify a mechanism for controlling fertilization in termites, we focused on the micropyles of eggs. The micropyle is a channel of sperm entry into a mature oocyte. Since termite queens are always attended by kings, the simplest and most effective mechanism to produce parthenogenetic eggs would be to close the micropyles of eggs in order to prevent sperm entry.

Observations of eggs from *R. speratus* showed that the number of micropyles varies greatly, even within a single colony. If a certain proportion of eggs lack micropyles (sperm gates), their fertilization would be mechanically impossible, regardless of whether or not a king was present. Genetic analysis has demonstrated that the embryos of eggs lacking micropyles develop parthenogenetically, whereas embryos from eggs with micropyles are fertilized and develop sexually. Analysis of eggs has shown that queens begin to lay eggs lacking micropyles when they are older, and thus must produce their replacements parthenogenetically. We found that *R. speratus* queens alter the number of micropyles in their eggs over time, thereby producing eggs lacking micropyles in order to generate their replacements asexually.

Why sexual reproduction?

Termite queens limit the use of parthenogenesis to generating replacements, although asexual reproduction by a queen doubles her contribution to the gene pool. Why do the queens still use sexual reproduction to generate most of the colony members, including workers, soldiers, and alates? Social insect queens face a dilemma regarding the costs and benefits of sexual vs. asexual reproduction. One proposed major advantage of sexual reproduction is that it promotes genetic variability across generations, facilitating adaptation to local ecological conditions. Overuse of asexual reproduction reduces the genetic diversity of the offspring and thus potentially reduces the ability of the colony to adapt to environmental stress.

Living in social groups also has drawbacks as well as advantages.

For example, infectious diseases spread more rapidly among groups than to solitary-living individuals. Transmission is more likely in groups because individuals live at high densities and have frequent social

contact. In addition, group members are close relatives and are therefore susceptible to the same parasitic infections. This can be understood using an analogy to human agriculture. Selective breeding of crops for desirable traits and against undesirable ones leads to monocultures – entire farms of plants that are nearly genetically identical. Little to no genetic diversity makes crops extremely susceptible to widespread disease.

The near-ubiquity of sexual reproduction is one of the most enduring puzzles in evolutionary biology, because all else being equal, asexual populations have a two-fold fitness advantage over their sexual counterparts and should therefore rapidly outnumber sexual populations. Termite queens which conditionally switch between sexual and asexual reproduction may hold the key to a better understanding this enigma.

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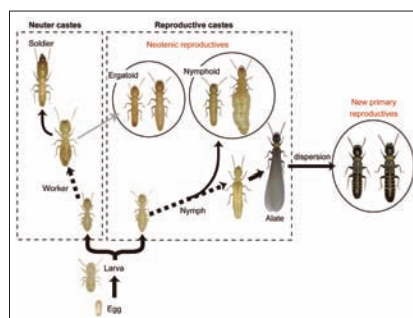
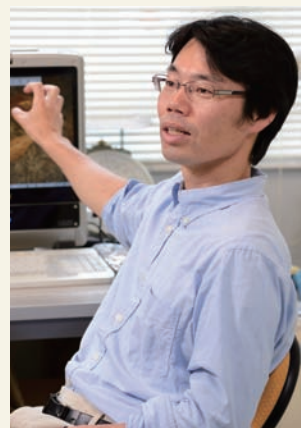


Fig. 1 Differentiation pathways of primary and secondary (neotenic) reproductives in *Reticulitermes* termites. Primary reproductives (queens and kings) are derived from alates found in new colonies. Ergatoids are neotenic reproductives differentiated from workers, and nymphoids are neotenic reproductives differentiated from nymphs. *PNAS* 111, 934–938, 17212–17217, 2014.

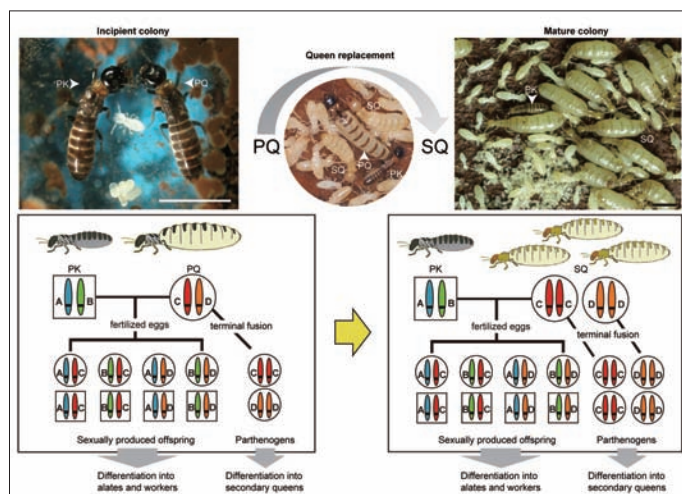
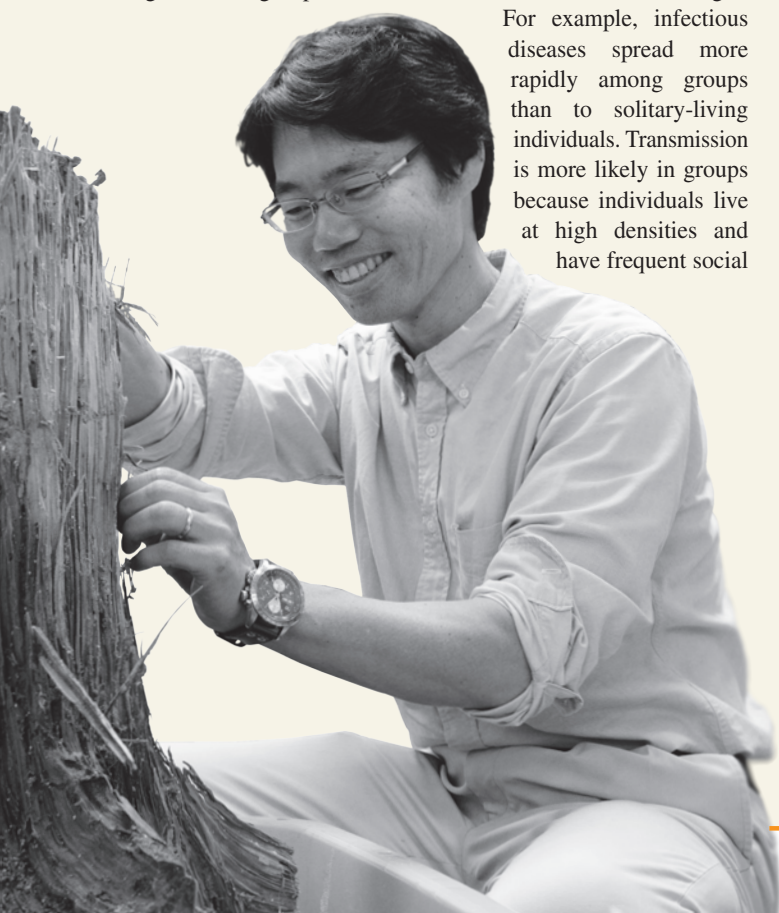


Fig. 2 Colony development and asexual queen succession in the termite *R. speratus*. As the primary queen senesces, secondary queens produced asexually by the primary queen differentiate within the colony and supplement egg production, eventually replacing the primary queen. Squares indicate males and circles represent females. PK, primary king; PQ, primary queen; SQ, secondary queen. (Scale bars: 3 mm.) *PNAS* 111, 934–938, 17212–17217, 2014.



Why Do We Cooperate? — An Answer from Game Theory

FOREFRONTS OF RESEARCH AT KYOTO UNIVERSITY

A major objective of my research is to explain why people cooperate, even when it is costly to do so, by using a mathematical tool called game theory.

What is game theory?

Game theory is not just used for board games. It deals with situations where the best thing to do depends on what others do. Game theory aims to describe people engaged in such *strategic situations* in their choice of actions. In a sense, it provides a decision theory for those living in a society in which many people interact with each other.

Although my own research concerns cooperative behavior, game theory can also explain diametrically opposite behaviors such as competition and confrontations, or analyze any strategic situation. The very fact that we live in society makes game theory useful in understanding many daily decision-making situations.

How does game theory explain cooperation?

It is touching to see people help each other, as in mutual aid, teamwork, and dedication to their groups. In some cases, they just cooperate from a sense of joy in doing so. In other cases, cooperation is costly, so it is tempting for some people to shirk their obligations. For example, it is regarded as cooperative behavior for an employee to work hard for his company. Of course, it is easier for him to shirk. However, shirking may lead to poor evaluations that impact his future salary. I suppose this fear motivates many employees to work hard. To put it another way, without incentives such as salaries, we would more easily succumb to the temptation to shirk.

In reality, however, we often engage in cooperation which is beneficial to others even in the absence of salaries. What are the driving forces behind this behavior?

Many game theorists point out that our interactions with each other are never one-shot, but that we interact over long periods of time. In such long-run relationships, if one succumbs to temptation today, one's standing in the future may be reduced. For example, the other people involved may no longer be cooperative in future interactions. A forward-looking person would take that concern seriously and would behave more cautiously. In this line of reasoning, concerns about future outcomes play an evaluative role and prevent one from succumbing to temptation. This is the basic logic that game theory offers. It is powerful because it suggests that even selfish people can sustain mutual cooperation.

Good cooperation needs effective punishment.

What is the most interesting aspect of this theory of cooperation? A deviator who has not cooperated previously must be punished so severely that his gain from this deviation is offset. This punishment must not only be severe but also credible. Thus, if someone has

actually deviated, it must be in the interests of the others to execute the punishment. The theory of cooperation, therefore, is coupled with a theory of punishment, and I find this interdependence between cooperation and punishment very interesting.

In reality, punishment can take various forms. It may simply mean doing nothing when someone who has deviated in the past needs help from others later on. Sometimes it may be much harsher. For example, if a firm treats its workers poorly, they may punish the firm not merely by a slowdown in work rate but also by sabotage. Now the point to note here is that while sabotage is a more severe punishment than a slowdown, it is also more costly for the workers, so we must examine their incentives for taking such action. In price-fixing cartels, a price cut may trigger a retaliatory price war. This is another example of harsh punishments. Which punishments are most effective in terms of severity and credibility? We need to answer this type of question in order to determine whether specific cooperative outcomes can be attained or not.

What do I do as a researcher?

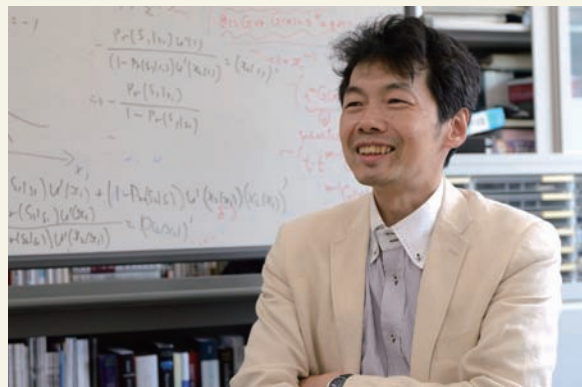
What I have described so far concerns the great achievements of game theory, especially those involving the theory of *repeated games*, as formulated by many of my brilliant predecessors in this field of research. Repeated games model long-run relationships and have structures in which one game is played again and again over many periods. I also work on repeated games, but with a much narrower focus.

One important assumption in the repeated-game-based theory of cooperation is that any deviation from cooperative arrangements is detected and hence is punished. However, not every single deviation is obvious. Sometimes, poor conditions may retard performance despite the best efforts of those involved. Alternatively, sheer luck may hide lack of hard work. Thus, it is more realistic to assume that the members of long-run relationships lack the ability to correctly understand their intended actions. Cooperation is harder to sustain under this alternative assumption of *imperfect monitoring*. I am investigating how best to overcome this difficulty.

Cooperation under imperfect private monitoring

I started my academic career studying a special class of imperfect monitoring, in which each player in a repeated game individually and privately receives an imperfect signal of the other players' actions. At that time, few papers had been written on this information structure known as *imperfect private monitoring*. I came up with the first result showing that highly cooperative outcomes are sustainable even under private monitoring.

Let me explain the novel technique I used. The standard approach to achieve cooperation in the model of



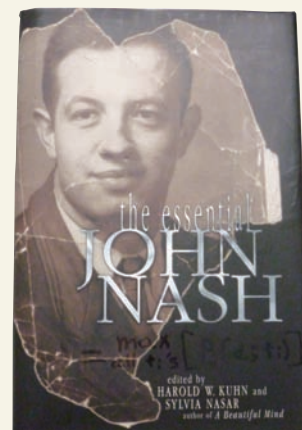
repeated games is to set up a cooperation phase and a punishment phase. In the cooperation phase, the players are supposed to cooperate with a probability of 1.0. However, I introduced the possibility that the players may deviate with a very small probability in the cooperation phase. This trick simplifies the analysis of the way in which each player processes the information he receives during the course of play. This technique proved to be very useful and has occasionally appeared in my subsequent published papers.

Cooperation thanks to imperfect monitoring

One interpretation of this result is that ingeniously constructed play in the repeated game overcomes the obstacles raised by imperfect monitoring. However, imperfect observability is not always an obstacle. Sometimes, imperfect monitoring creates strategic possibilities that would not be feasible if the actions taken were perfectly observable. Here, imperfect monitoring should be interpreted as an aid, not an obstacle, to cooperation. This interesting phenomenon was already known to exist in the case of imperfect private monitoring, but I showed that this result could also be extended to include other repeated game models with imperfect monitoring.



One reward for research success is citation by other publications. This photo shows books citing my work. Some books and journal articles cite it favorably, and some others not so favorably. It does not matter, as every citation counts equally, and therefore is equally important to me! The journal volume with the green cover is a special issue on the topic I worked on, and all the articles in this volume cite my paper.



John Nash is one of the few Nobel Laureates I have talked with. His solution concept, the Nash equilibrium, has changed game theory quite a lot. I am a consumer of his theories. While preparing this article, I was saddened to receive the news of his death in a car accident.

Tadashi SEKIGUCHI

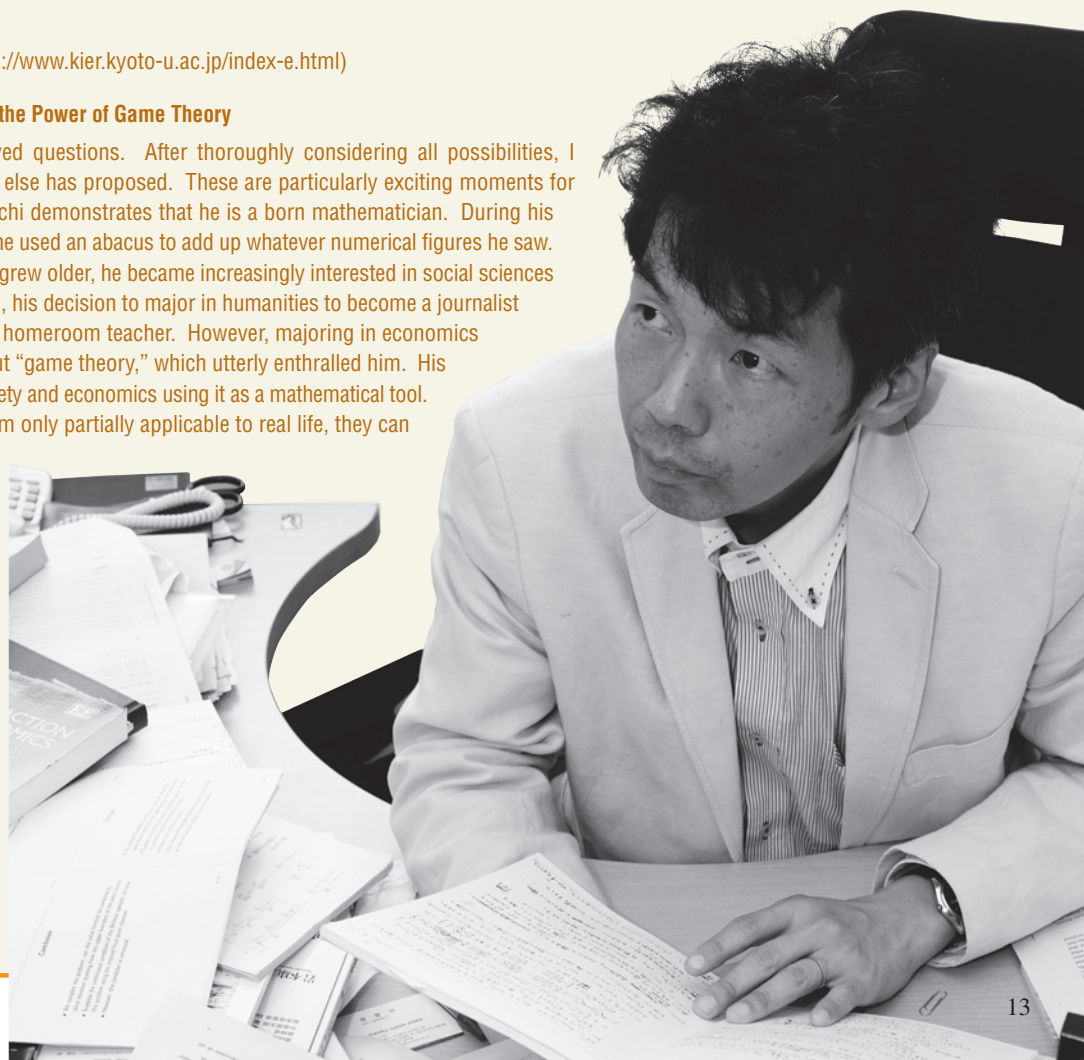
- Born in 1969
- Ph.D., the University of Tokyo
- Professor, Institute of Economic Research (<http://www.kier.kyoto-u.ac.jp/index-e.html>)

Addressing Unsolved Questions to Demonstrate the Power of Game Theory

"It's interesting to seek solutions to unsolved questions. After thoroughly considering all possibilities, I sometimes reach solutions in ways that no one else has proposed. These are particularly exciting moments for me." This remark by Professor Tadashi Sekiguchi demonstrates that he is a born mathematician. During his elementary school days, whenever he had time, he used an abacus to add up whatever numerical figures he saw. At school, he excelled in mathematics, but as he grew older, he became increasingly interested in social sciences as well. In his second year of senior high school, his decision to major in humanities to become a journalist surprised everyone around him, particularly his homeroom teacher. However, majoring in economics as a university junior, he happened to learn about "game theory," which utterly enthralled him. His encounter with this theory led him to analyze society and economics using it as a mathematical tool.

"Although abstract mathematical models seem only partially applicable to real life, they can in fact explain actual economic activities and human behaviors. Isn't that interesting?" Professor Sekiguchi was the first to suggest that some level of cooperation is sustainable even under "imperfect private monitoring," a condition which had previously been regarded as too complex for theoretical analysis. He is motivated by his strong aspiration to "demonstrate the power of game theory as an effective tool to resolve economic problems."

"There are so many problems that I want to address. Frankly, I prefer research to vacation." Despite this comment, he does spend most of his holidays with his young son.





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Washoku, or traditional Japanese cuisine, was included on the Representative List of the Intangible Cultural Heritage of Humanity in 2013 and is appreciated worldwide in recognition of its health giving qualities and elegant presentation methods, as well as its excellent flavors. *Washoku* is a general term for a wide variety of local cuisines that depend upon locally sourced ingredients and culinary arts. Among them, Kyoto style cuisine is particularly well known.

Since Kyoto is far from the sea, fresh seafood was historically hard to obtain. So Kyoto developed culinary arts using unique blends of simple ingredients, particularly local vegetables. It is generally thought that Kyoto style cuisine originated during the Heian Period (794–1192) in the form of ceremonial dishes served on specific occasions for court nobles. While these ceremonial dishes were influenced by Chinese dietary culture, the Buddhist vegetarian tradition also became widespread. Following the introduction of

Zen Buddhism from China during the Kamakura Period (1192–1333), *shojin ryori*, the vegetarian cuisine developed in Chinese Zen temples, became popular not only among monks but also among the laity. Reflecting the dietary etiquette of Zen Buddhism and Chinese culinary arts, *shojin ryori* helped develop a wide variety of vegetarian recipes, including those making use of processed foods such as tofu and miso. During the Muromachi Period (1336–1573), *chanoyu*, the tea ceremony culture, flourished. At a tea ceremony, in addition to the hot powdered green tea, dinner was served as an essential part of the proceedings. The host of the tea ceremony was expected to decorate the room with ornaments indicating the season of the year, select tableware that best suited the season and the occasion,

and arrange food in each dish or bowl in the most refined manner. In this way, the host was expected to feast the eyes of the guests as well as their palates. Assimilating the influence of various cultures and religions throughout the past millennium, Kyoto style cuisine in this ancient capital evolved into the delicacies we now know today.

One essential component of Kyoto style cuisine is *dashi* stock, primarily made from *kombu* or edible kelp. In a joint effort with chefs at Japanese restaurants, researchers at Kyoto University have investigated the essence of its flavor. The university has also held hands-on events where participants learned various ways of preparing *dashi* stock and distinguishing flavor differences that depend on the stock preparation method. In this way, the university has contributed to the scientific understanding of Japanese culinary culture, with a particular focus on *dashi* stock.

京都
逍遙

PROMENADE

Kyoto Style Cuisine— Delicacies That Have Evolved Throughout Kyoto's Long History

① *Shikibochō* (lit. ceremonial knife) is a ritual associated with the filleting of fish or chicken. Since the Heian Period, this ritual has been observed at the Imperial Court on auspicious occasions. In this ritual, a fish or chicken placed on a cutting board is filleted using only a knife and a pair of metal chopsticks, without touching it with the hands. This culinary art has survived to the present day with occasional demonstrations at shrine rituals. ② Conger pike is the most common ingredient in Kyoto style cuisine during summer. Since this fish survives longer than other fish species after being caught, it was valued highly in Kyoto in historical times when fresh seafood was virtually unavailable. On the other hand, this fish has many small rib bones, making it difficult to chew. Accordingly, expert chefs make as many as 25 cuts in a 3-cm-long fillet. The more cuts a chef makes, the more skillful the chef is considered to be. Conger pike is good for a wide variety of menu items, including *tsukuri* (thinly sliced raw fish), *sunomono* (fish dressed with sweet vinegar sauce), grilled fish, tempura, and stew. The photo shows a clear soup of conger pike. ③ *Shojin ryori* was developed during the Kamakura Period. Using only vegetables and beans, various delicacies have been invented with flavors, textures, and appearances similar to those of fish and chicken. ④ Soup stocks used in Western and Chinese cuisines contain many types of amino acid, which combine to create a deep, rich flavor. In contrast, Japanese stock, known as *dashi*, contains only glutamine, asparagines, and inosinic acids. This simple composition effectively preserves the original flavors of the individual ingredients. ⑤ *Obanzai*, or home-cooked local dishes, are also representative of Kyoto style cuisine. These dishes primarily use vegetables and fish cooked with only a little seasoning, so as to preserve the original flavor of each ingredient. Today, these dishes have become extremely popular in recognition of their positive health benefits, and are available at many restaurants and supermarkets.

